STaRFlow: A SpatioTemporal Recurrent Cell for Lightweight Multi-Frame Optical Flow Estimation

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Paper **#786**, poster session **T3.1**

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Optical Flow is the **apparent displacement** between two frames

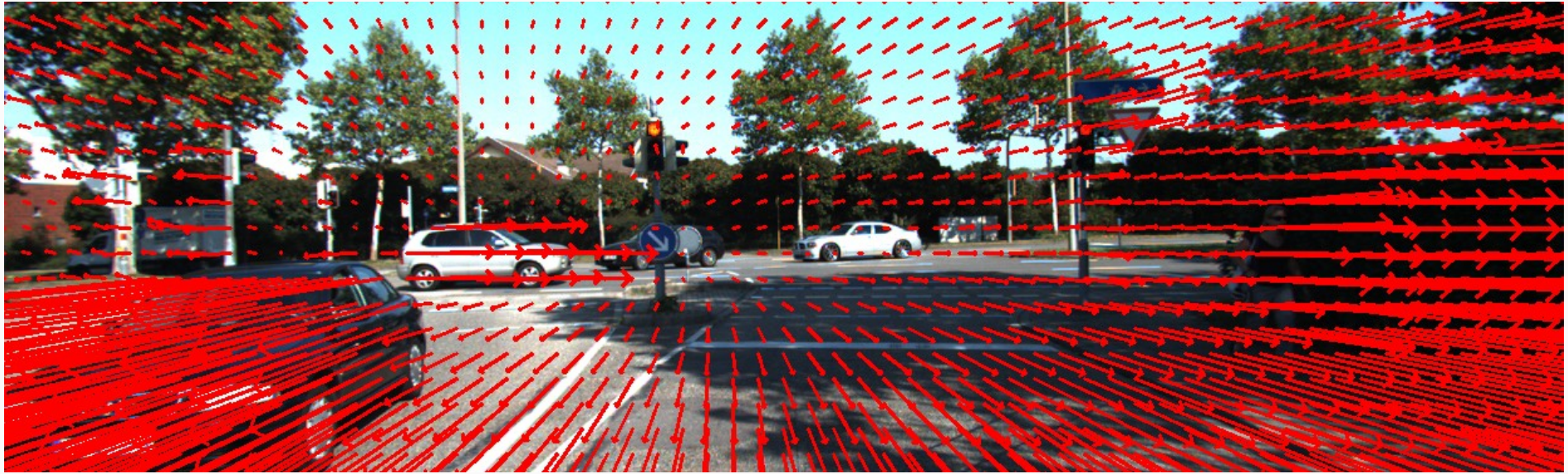
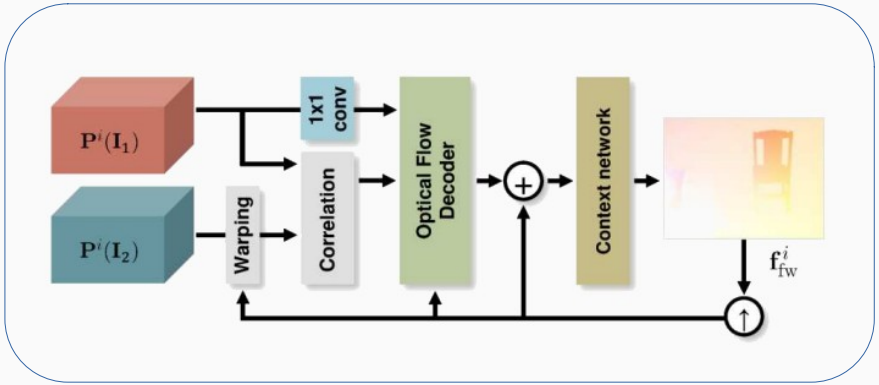


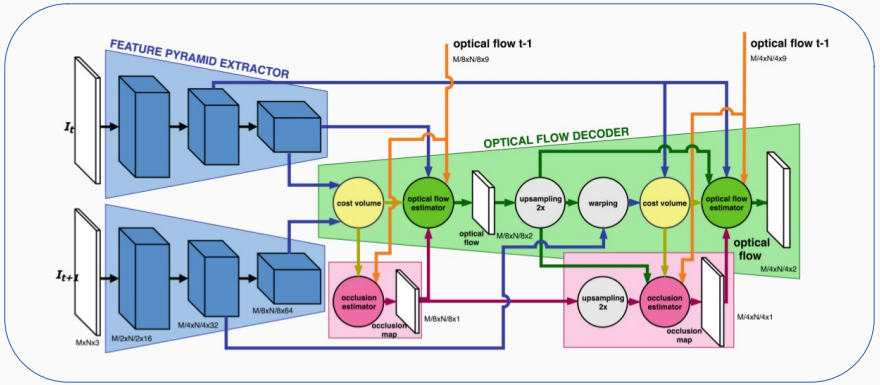
Image from KITTI 2015 dataset : http://www.cvlibs.net/datasets/kitti/

Previous work



IRR-PWC

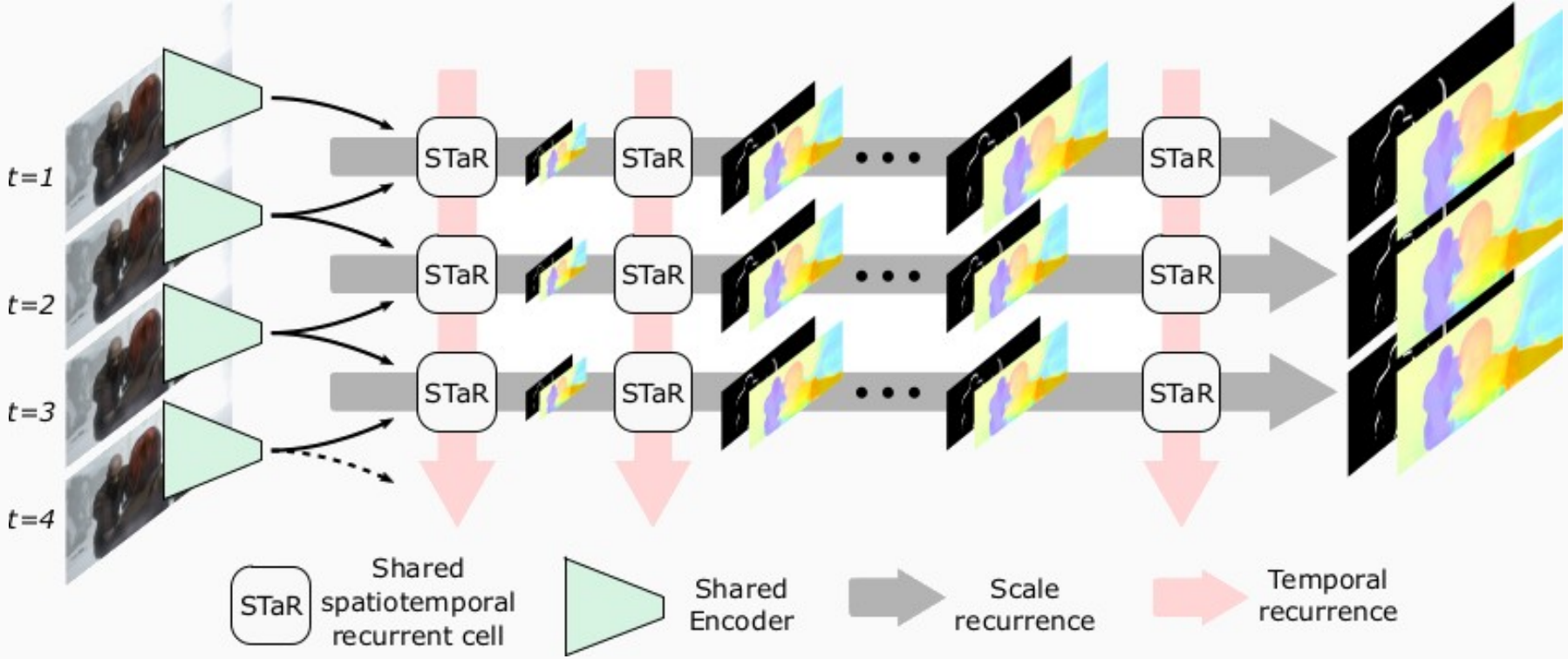
Hur and Roth, CVPR 2019



ContinualFlow

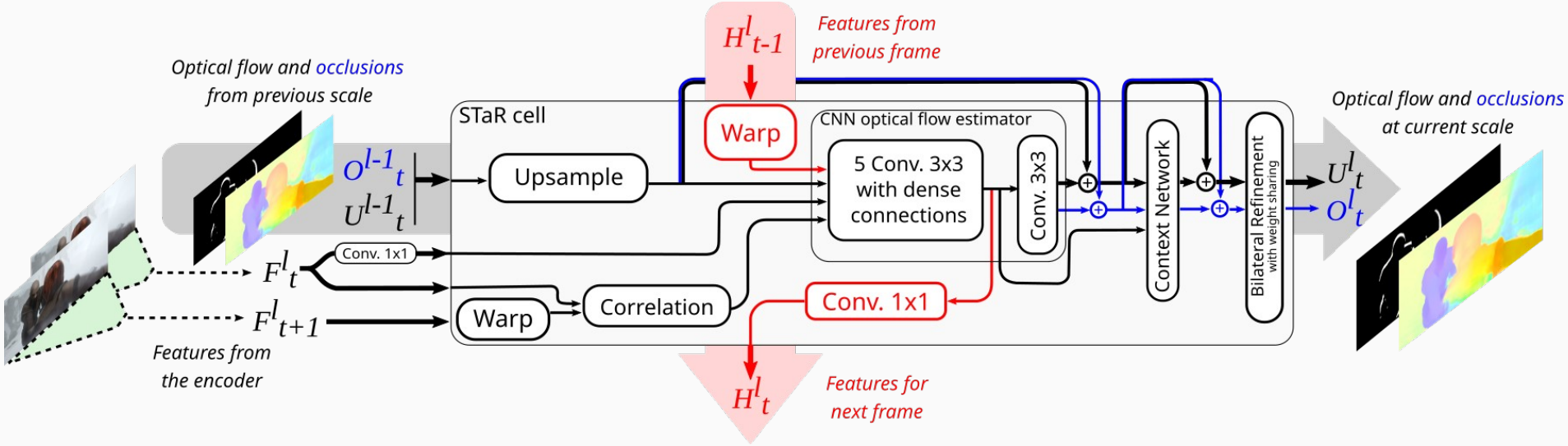
Neoral et al., ACCV 2018

The SpatioTemporal Recurrence of STaRFlow



Our PyTorch implementation is available at : https://github.com/pgodet/star_flow

STaRCell



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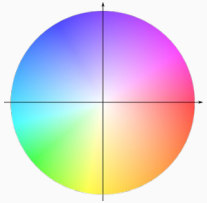
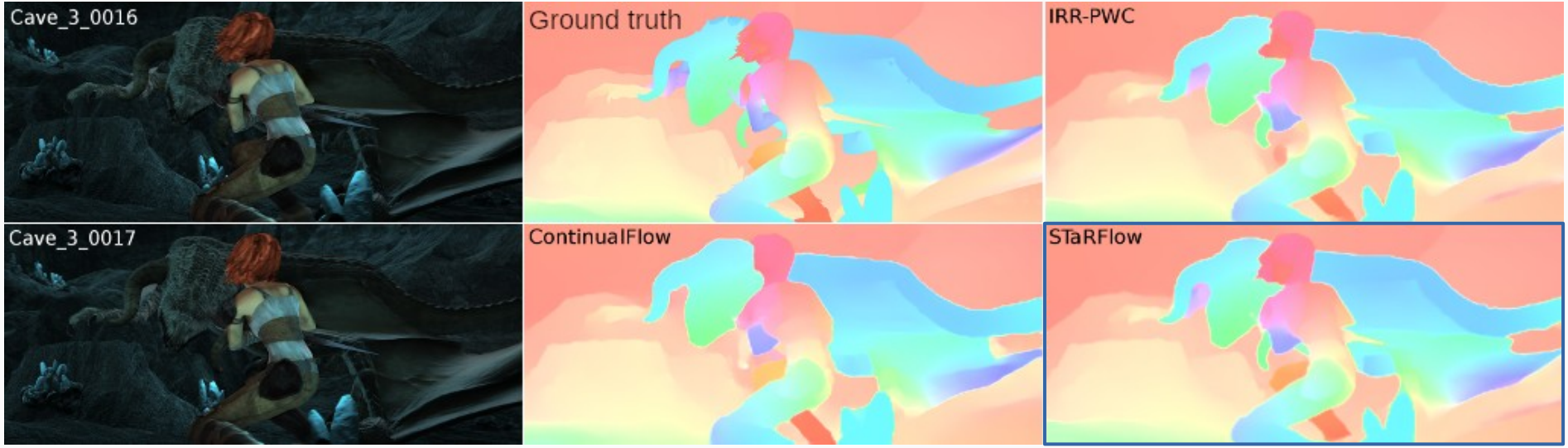
Results on benchmarks

Method	Endpoint error on **Sintel Final**	% of outliers on **KITTI 2015**	Number of parameters
PWC-Net *(Sun et al., 2019)*	4.60 px	7.72 %	8.75 M
SelFlow *(Liu et al., 2019)*	4.26 px	8.42 %	4.79 M
ContinualFlow *(Neoral et al., 2018)*	4.53 px	10.03 %	14.6 M
IRR-PWC *(Hur and Roth, 2019)*	4.58 px	**7.65 %**	6.36 M
STaRFlow *(ours)*	**3.71 px**	**7.65 %**	**4.77 M**

STaRFlow is trained on image pairs from FlyingChairs, sequences from FlyingThings3D and sequences from MPI Sintel or KITTI

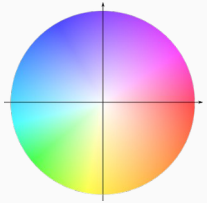
Qualitative results

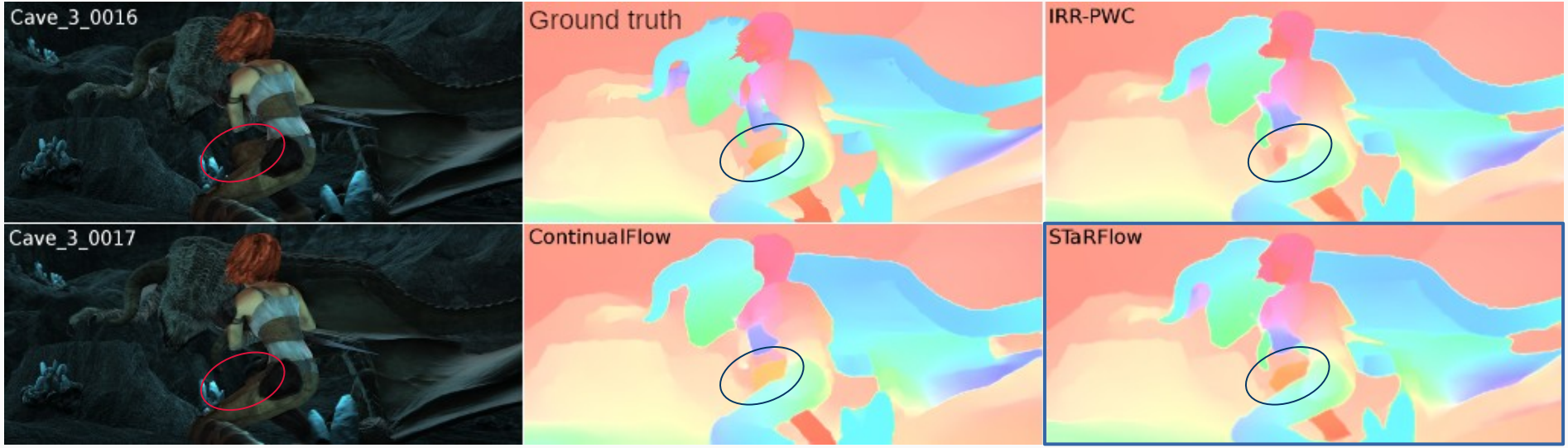




Results on MPI Sintel dataset, final pass : http://sintel.is.tue.mpg.de/

Multi-frame improves estimation in **occluded regions**





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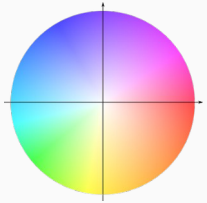
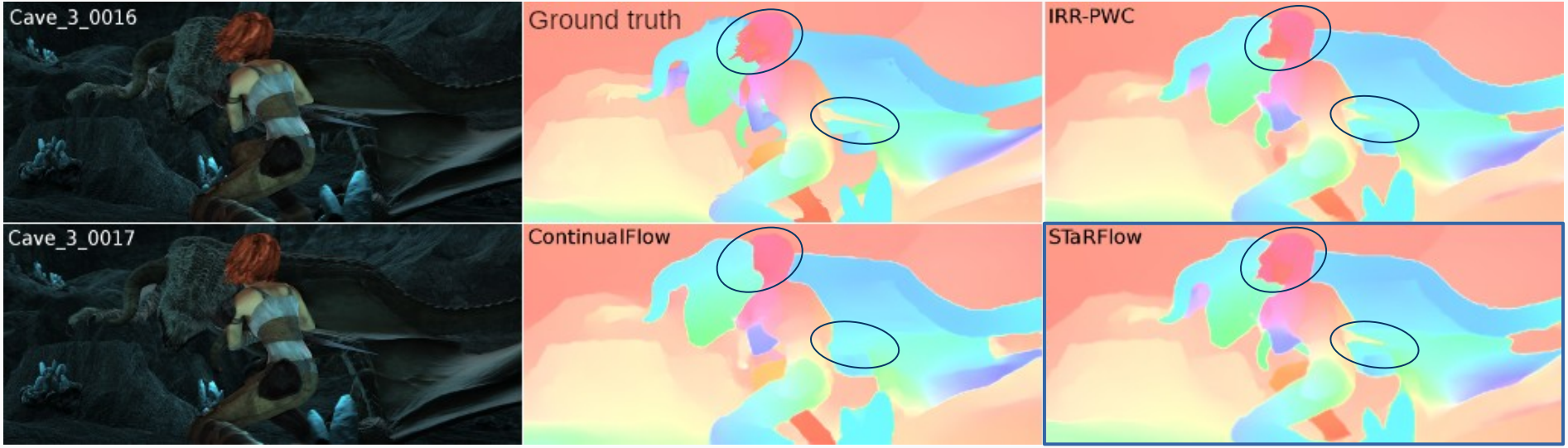
Improved spatial resolution





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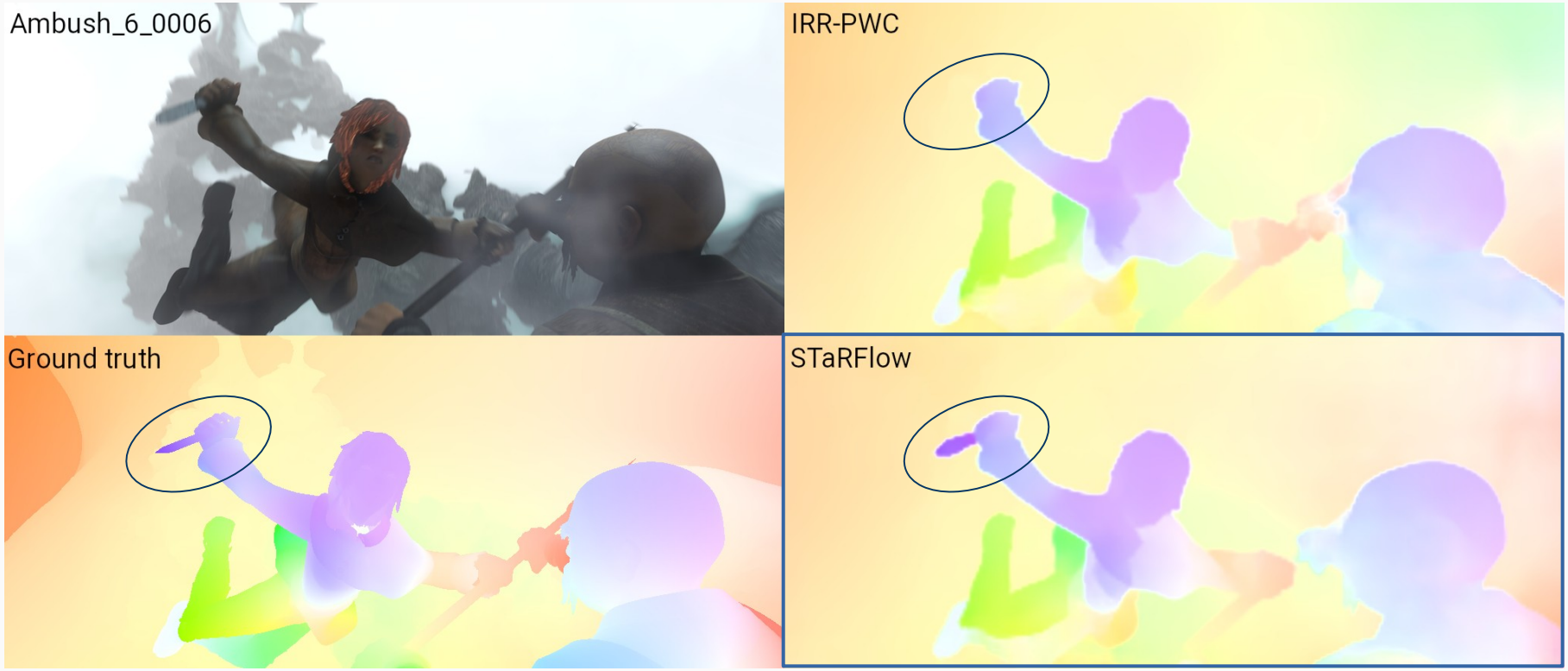
Small and fast moving object



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Results on real data (recorded with a smartphone)

Take-home points

- We **leverage temporal coherence** by implementing a **temporal memory** able to accumulate information from the past.
- This **improves** optical flow estimation at **occlusions** and on **small objects**.
- Thanks to **weight sharing** our architecture has a **low number of parameters** (4.77 M).
- At paper writing time : STaRFlow = **state of the art on MPI Sintel final**.

Thank you for your attention

STaRFlow

https://github.com/pgodet/star_flow

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